PATENT SPECIFICATION 1,091,030

DRAWINGS ATTACHED

The Inventor of this invention in the sense of being the actual deviser thereof within the meaning of Section 16 of the Patents Act, 1949, is:—JEAN CHARLADE, a French citizen, of 4 Villa Les Escanaux, Bagnols-sur-Ceze, 30 Gard, France.

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COMPLETE SPECIFICATION.

A Machine for Machining the Inside Surface of a Tube.

We, COMMISSARIAT A L'ENERGIE ATOMIQUE, an organization created in France by ordinance No. 45-2563 of 18th October 1945, of 29 rue de la Federation, Paris 15e, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a machine for machining, more particularly grinding, a chamfer or groove in the inside wall of a very long tube, which may be straight or slightly bent.

Its main object is to provide a machine which is very simple to make and has very varied applications, particularly because it can work very remotely in places where conventional systems cannot be used.

According to the invention there is provided a machine for machining the internal surface of a tube, having a motor member whose shaft rotates the machining tool, characterised in that the motor member is pivoted on a transverse pivot supported by a cylindrical sleeve adapted to be coaxial with the tube and mounted so that it is rotatable inside a fixed support insertable in the tube and lockable relative to the tube by a releasable locking device.

The rocking movement of the motor member ensures penetration of the tool in the inside wall of the tube, whereas the rotary movement of the unit consisting of the motor member and rotary sleeve, because of the reaction of the tool on the wall, ensures machining of a circular groove or chamfer.

In a preferred embodiment of the invention, the releasable locking device for the fixed support comprises at least one annular deformable envelope attached to the external surface of the support, said support being lockable relative to the tube by inflating the envelope by air pressure or with compressed fluid so as to engage the envelope with the internal surface of the tube. To this end, the machine is connected to the outside of the tube by a rod for longitudinal positioning and by flexible ducts connected to the deformable envelope and the motor member.

The invention will now be described by way of example with reference to the accompanying drawing the single figure of which is a diagrammatic longitudinal section through a machine mounted inside a tubular element which is to be machined.

As the figure shows, the machine 1 is intended for the machining of a circular groove or chamfer 2 in the inside wall 3 of a tubular element 4, and more particularly a tubular element which is very long and whose diametrical dimensions are such that conventional machining devices cannot be inserted therein. The machine 1 consists mainly of a motor member 5 (of the pneumatic or electric motor type) whose shaft 6 supports at one end a machining tool, in this case a grinding wheel 7 rigidly connected to the shaft 6. The motor member 5 is pivoted on a transverse pivot 8 whose ends are supported by a sleeve 9 arranged coaxially inside the tubular element 4. The rocking of the motor member 5 inside the sleeve 9 is determined by means of a spring 10 which has a lifting action and transmits sufficient force to the grinding wheel 7 for the latter to exert on the wall 3. A counterweight 11

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balances the unit made up by the motor member and the grinding wheel. The counterweight ensures that the penetration action of the grinding wheel is constant when the apparatus is vertical. The motor member 5 is supplied with air or electricity—according to its type—along flexible ducts (not shown) communicating with a connecting member 12 in a fork 13. The fork is mounted inside a fixed cylindrical support 15 on a ball-and-socket joint 14, which prevents the air ducts or electrical cables from turning on themselves during rotation of the motor member. On the other hand, the sleeve 9 can turn freely inside the support 15 on bronze bushes such as 16, 17 rigidly connected to this support. The rotation of the sleeve, which is due to the reaction of the grinding wheel 7 on the wall 3 of the tubular element, ensures machining of a perfectly circular chamfer or groove 2. It must be noted that the reaction causing the rotation of the unit is determined by suitably selecting the characteristics of the spring 10. If the reaction of the tube on the grinding wheel were excessive, the grinding wheel would come out of the groove and turn inside the tube without cutting its surface. The rotary movement of the sleeve supporting the motor/grinding-wheel unit must therefore be braked. When the grinding wheel skates round while attacking the tube wall, the counter-reaction created by the spring makes it continue to bear on the wall.

The support 15 is locked relative to the tubular element 4 by means of a deformable envelope 18, possibly in several parts as illustrated, connected to a compressed fluid or air source by a duct 19. This deformable envelope can be inflated so that it is flattened against the internal wall of the tubular element and so holds the machine in the operative position throughout machining of the chamfer 2 by the wheel 7.

After completion of the chamfer the machine is retracted or shifted by deflating the envelope 18 and pressurising—along a duct 20—a second, auxiliary deformable envelope 21 situated under the connecting member 12 so that the motor member 5 rocks about its pivot 8 against the action of the spring 10, disengaging the wheel from the wall 3. This auxiliary envelope is, of course, deflated during operation of the grinding wheel. The whole of the machine is then moved inside the tubular element by a rod operated at one end by any suitable means outside the tube.

Obviously, the invention is not restricted to the particular embodiment just described. Many constructional changes may be made within the scope of the appended claims, especially to improve the conditions of use of the machine e.g. a television camera may be inserted by the other end of the tubular element for continuous monitoring of the action of the tool, automatic means may be used for monitoring the machine position, and the spring ensuring pressure from the grinding wheel may be replaced by a resilient band fixed to the sleeve and forming a cradle for the motor or by a pneumatic cushion. Also, it should be noted that the compact construction of the machine makes it suitable for use in either rectilinear or slightly curved tubes.

WHAT WE CLAIM IS:—

1. A machine for machining the internal surface of a tube, having a motor member whose shaft rotates the machining tool, characterised in that the motor member is pivoted on a transverse pivot supported by a cylindrical sleeve adapted to be coaxial with the tube and mounted so that it is rotatable inside a fixed support insertable in the tube and lockable relative to the tube by a releasable locking device.

2. A machine as set forth in Claim 1, characterised in that the releasable locking device for the fixed support comprises at least one annular deformable envelope attached to the external surface of the support, said support being lockable relative to the tube by inflating the envelope by air pressure or with compressed fluid so as to engage the envelope with the internal surface of the tube.

3. A machine as set forth in Claim 2, characterised in that the machine is adapted to be connected to the outside of the tube by a rod for longitudinal positioning and by flexible ducts connected to the deformable envelope and the motor member.

4. A machine as set forth in Claim 3, characterised in that the flexible ducts are connected to the deformable envelope and the motor member by means of a connecting member held in a fork which is mounted in a ball-and-socket joint attached to the fixed support for the purpose of preventing twisting of the ducts during rotation of the motor member.

5. A machine as set forth in any preceding claim, characterised in that the motor member is subject to the action of a resilient device fixed on the cylindrical sleeve and transmitting pressure applying the tool to the tube wall.

6. A machine as set forth in Claim 5, characterised in that the resilient device is a spring.

7. A machine as set forth in Claim 5, characterised in that the resilient device is a flexible band forming a cradle for the motor member.

8. A machine as set forth in Claim 5, characterised in that the resilient device is a pneumatic cushion.

9. A machine as set forth in any preceding claim, characterised in that an auxiliary deformable envelope co-operates with the connecting member to cause the motor member to rock in the direction opposite to the action of the resilient device to disengage the tool from the tube wall.

10. A machine as set forth in any preceding claim, characterised in that the unit consisting of the motor member and machining tool is balanced about the transverse axis by a counterweight.

11. A machine as set forth in any preceding claim, characterised in that the cylindrical sleeve rests inside the fixed support on bushes, more particularly bronze bushes.

12. A machine as set forth in any preceding claim, characterised in that the machining tool is a grinding wheel.

13. A machine for machining the internal surface of a tube substantially as described and as shown in the accompanying drawing.

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1 SHEET

This drawing is a reproduction of the Original on a reduced scale